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(54) CURTAIN WALL STRUCTURE

(71) We, "APPLICATIONS LA CHIMIE, DE L'ELECTRICITÉ ET DES MÉTAUX", EN ABRÉGÉ "SADACEM", EN NÉERLANDAIS: "AANWENDING VAN CHEMIE, ELECTRICITEIT EN METLEN", IN 'T KORT: "SADACEM", a Belgian Company of 31, rue de la Science, Brussels, Belgium, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention has an object the provision of improvements in the construction of so-called "anti-seismic" frontages of curtain-walls, that is curtain walls which can withstand without damage earth tremours or strong vibrations caused by explosions or the passage of planes through the sound barrier.

The swinging or vibrating motions of building skeletons to which are fastened curtain walls tend to be transferred to the frontage elements forming the curtain wall. The accelerations when a building vibrates, can be very strong and cause very damagnig destructive stresses in the mountings, the frames and the glazing of these elements. Additionally, vibrations induced in the frontage elements by strong noises or explosions are transferred to the bearing elements fastened to the building skeleton.

In accordance with the present invention, there is provided a curtain wall structure comprising an array of glazed metal frames arranged in cladding relationships with a building skeleton, each frame having a cross bar bearing on or hanging from a projecting element which projects from and is secured to the building skeleton and is provided with resilient means on which said cross bar bears and each frame being provided with members for stabilising it, relative to the building skeleton, against wind forces.

According to a preferred arrangement, said resilient means comprises a block of resilient-material, and said cross bar has an abutment by which it bears upon said block. The block and abutment may both be rectangular in which case the block preferably has its bottom face formed with at least one recess running in its length direction and at least one recess running in its cross direction. Another preferred shape for the block is that of a truncated cone.

The stabilising members aforesaid preferably comprise shock absorbers allowing the metal frame to move in the direction towards and away from the building skeleton and to move across said direction. Conveniently each of said members comprises a cylinder and means for clamping absorber pads on the ends thereof, the pad at the one end of the cylinder engaging an element pertaining to the metal frame and the pad at the other end engaging a fastener secured to the building skeleton. The absorber pads may be retained by screw means between cup-shaped stops.

The following description in which reference is made to the accompanying drawings is given in order to illustrate the invention. In the drawings:

Figure 1 is a diagrammatic vertical cross-section taken through one storey of a building and adjacent parts of a curtain wall structure; this figure shows in an exaggerated manner the distortions to be accommodated.

Figure 2 is a diagrammatic plan showing the arrangement and mounting of the curtain wall elements in accordance with the invention.

Figure 3 is a perspective view of part of an embodiment of the invention.

Figure 4 is a longitudinal cross section on a larger scale, of a part of the embodiment of Figure 3.

Figure 5 is a perspective view with parts broken away, of part of a further embodi-

ment of the invention, and

Figure 6 is a sectional view taken along line VI-VI in Figure 5.

The arrangements as shown in the drawings substantially reduce the problems caused by the fastening and hanging of very large-sized framed curtain wall parts upon a building skeleton the floor parts or columns of which can undergo large short-time distortions due to vertical vibrations in the floor parts, horizontal vibrations in the frontage plane, and horizontal vibrations at right angles to the frontage plane.

The amplitude of the vertical motions to be damped corresponds to the sum of those amplitudes transferred by the columns and the amplitudes due to the floor parts bending between the columns. The amplitude of the horizontal motions corresponds to the combination of those amplitudes due to the ground movements and any induced structure resonance.

In Figuret 1, the dotted curved lines show, in an exaggerated way, the pattern of the vertical vibrations in one of the floor parts 7. The effect of the horizontal vibrations in the frontage plane is shown at 2 and the effect of the horizontal vibrations at right angles to the frontage plane is shown at 3.

Figure 2 shows the locations of the projecting elements to which the glazed frames are secured and of the members for stabilising the frames against the wind-forces. The position of a projecting element for hanging a glazed frame is shown at 4 and the positions of members for stabilising the frames are shown at 5. The glazed frames are shown diagrammatically in figures 1 and 2 at 6, the floor parts at 7 and the columns at 8. The structure according to the invention makes use, for closing the space remaining between the metal frames, of sealing elements with a V- or W-shaped section.

The sealing elements have a very high resiliency, due not only to the material from which they are made but also to the particular shape thereof. Said shape is similar to a concertina shape.

In the arrangement shown in Figure 3, the frame 10 is provided with a cross bar 9. Said cross bar bears via an abutment plate 11, which is soldered thereto, upon a block 12 of resilient material which bears in turn on a plate 13 which is to be joined in a way known per se, to the floor part of the building skeleton. The bottom surface of the resilient block 12 which contracts plate 13, is preferably provided with a lengthwise slit 14 and one or two cross slits 15.

The frame 10 is further retained by members 16 for stabilising it against wind forces. These members 16 are designed according to the invention, to allow substantial movements of the frames 10 towards, away from and parallel to the frontage. They are fastened to the floor parts of the building skeleton via angle-irons 17 (Figures 3 and 4).

As shown in Figure 4, the angle-iron 17 is clamped between two absorber pads 18 formed of resilient material and retained inside cups 19. All of these parts are threaded on a bolt 20 which is screwed into a cylinder 21 which receives at its opposite end a bolt 22 having the same function as the bolt 20. The absorber pads 18 clamped in the cups 19 retain captive, by means of bolt 22, the cross bar 9 of frame 10.

The magnitude of the movements produced by wind forces is dependent on the nature of the resilient material of the absorber pads 18 and also on the degree of clamping thereof produced by bolts 20 and 22. A magnitude range for admissible movements is indicated by angle α as shown in Figure 4.

Those movements which are made possible by the system provided by the invention are sufficietly large to ensure that substantial swingings or vibrations of the building skeleton will not cause damage in the glazing, in the metal frames or to the fastening means thereof.

In the arrangement shown in Figs. 5 and 6, a bearing element 23, which is L-shaped in cross-section has, soldered to its horizontal portion, a house 24 which is to be considered as a safety housing. Inside housing 24 is arranged a block 12 of resilient material. The cross bar 9 bears on the top side of said block 12 via an abutment plate 11. The end walls of housing 24 have cutouts 25 to receive the bar 9. The plate 11 is provided with a centering boss 26 which enters a corresponding opening 27 provided in the top of the block 12.

The vertical portion of element 23 is clamped via a fastening element 28 to the floor part 29 of the building skeleton by means of one or a plurality of bolts 30 going through a vertical slot 31 provided in the vertical portion of element 23. A screw jack 32 passing through part 33 soldered to the vertical portion of element 23 allows accurate adjustment of element 23 relative to fastening element 28.

It will be understood that the invention is in no way limited to the above embodiments and that many changes can be made therein without departing from the scope of the invention as defined by the appended claims.

WHAT WE CLAIM IS:

1. A curtain wall structure comprising an array of glazed metal frames arranged in cladding relationships with a building skeleton, each frame having a cross bar bearing on or hanging from a projecting

element which projects from and is secured to the building skeleton and is provided with resilient means on which said cross bar bears, and each frame being provided with members for stabilising it, relative to the building skeleton, against wind forces.

2. A curtain wall structure as defined in claim 1, in which said resilient means comprises a block of resilient-material, and said cross bar has an abutment part by which it bears upon said block.

3. A curtain wall structure as defined in claim 2, in which said block and said abutment part are both rectangular.

4. A curtain wall structure as defined in claim 3, in which the bottom face of said block is formed with at least one recess running in its length direction and at least one recess running in its cross direction.

5. A curtain wall structure as defined in claim 2, in which said block is in the shape of a truncated cone.

6. A curtain wall structure as defined in any one of claims 2 to 5, in which said block is arranged inside an open-topped housing which is secured by its bottom to said element and is formed with two side cut-outs to accommodate the cross bar.

7. A curtain wall structure as defined in any one of claims 2 to 6, in which said block is provided at the top thereof with an opening for receiving a centering boss provided on the bottom of said abutment.

8. A curtain wall structure as defined in any one of claims 1 to 7 in which the said members comprise shock-absorbers allowing the metal frame to move in the direction towards and away from the building skeleton and to move across said direction.

9. A curtain wall structure as defined in claim 8, in which each of said members comprises a cylinder and means for clamping absorber pads on the ends thereof, the pad at the one end of the cylinder engaging an element pertaining to the metal frame and the pad at the other end engaging a fastener secured to the building skeleton.

10. A curtain wall structure as defined in claim 9, in which said absorber pads are retained by screw means between cup-shaped stops.

11. A curtain wall structure as defined in any one of claims 1 to 10, in which said projecting element comprises two parts, the first one of which is made fast to the building skeleton, while the second is vertically movable in mating relationship relative to said first part, an adjusting jack being provided to adjust the position of both parts relative to one another.

12. A curtain wall structure substantially as hereinbefore described and illustrated by reference to Figs. 2 to 6 of the accompanying drawings.

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Sheet 1

FIG.1.

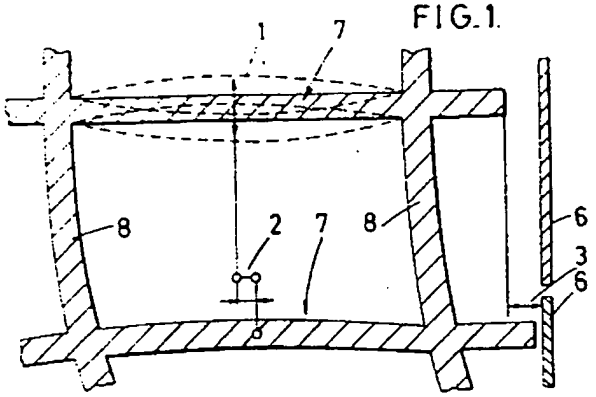


FIG.2.

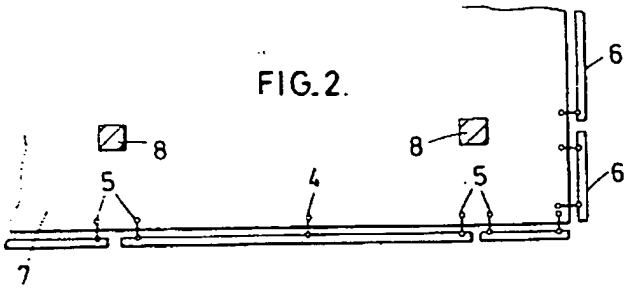
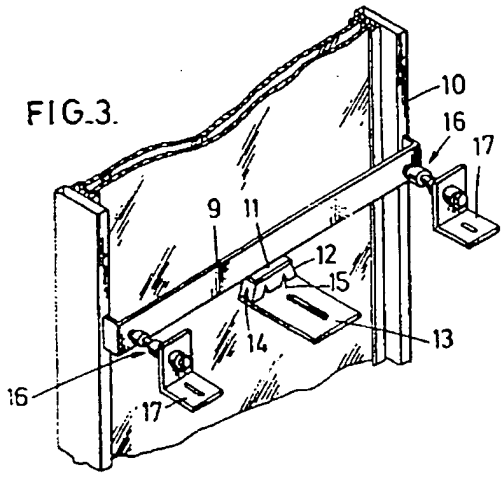


FIG.3.



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Sheet 2

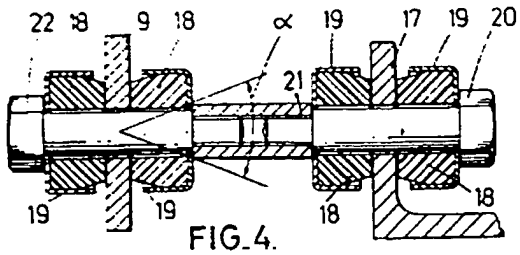

FIG_4.

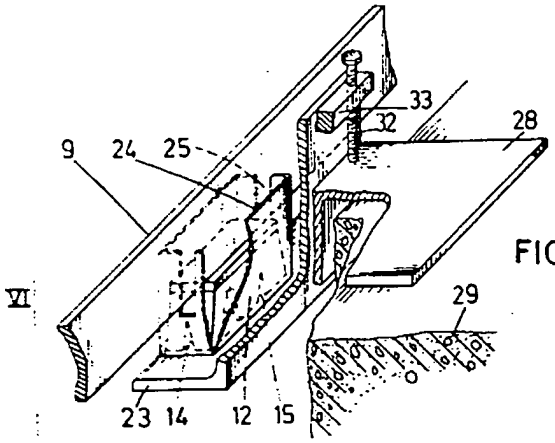

FIG_5.

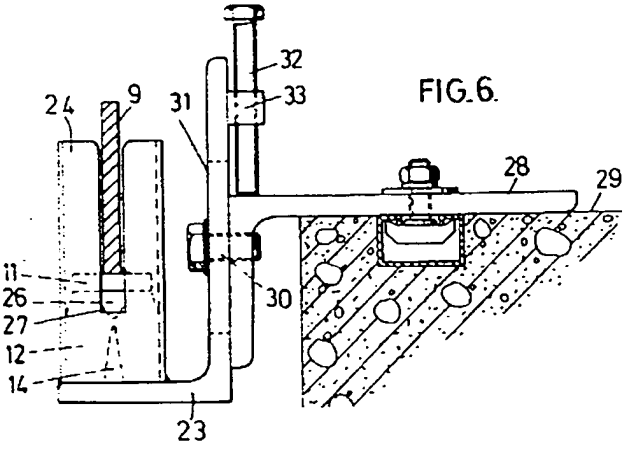

FIG_6.